

## Claims

- 1                   1. A method of fabricating a Schottky diode, comprising the steps of:  
2                   forming a first layer of insulative material having a first etch rate over the surface  
3 of a semiconductor substrate;  
4                   forming a second layer of insulative material having a second etch rate, the second  
5 etch rate being greater than the first etch rate, over the first layer of insulative material;  
6                   etching, in a single etching step, a window through the first and second layers of  
7 insulative material to the semiconductor substrate, the window forming walls having a topology  
8 of stepped thickness of insulative material due to the etch rates differing; and  
9                   depositing a metal in the etched window to form a metal-semiconductor substrate  
10 contact, the metal conforming to the topology of the walls of the etched first and second layers of  
11 insulative material in the window and the semiconductor substrate to form a stepped structure.
- 1                   2. The method as recited in claim 1, wherein the step of forming a first layer of  
2 insulative material comprises forming an insulative layer having a thickness of 350 to 400  
3 angstroms.
- 1                   3. The method as recited in claim 1, wherein the step of forming a first layer of  
2 insulative material comprises forming a layer of oxide.
- 1                   4. The method as recited in claim 1, wherein the step of forming a first layer of  
2 insulative material comprises forming a layer of TEOS oxide by a low pressure chemical vapor  
3 deposition process.
- 1                   5. The method as recited in claim 1, wherein the step of forming a first layer of  
2 insulative material comprises forming a layer of TEOS oxide having a thickness of  
3 approximately 350 to 400 angstroms.

1                   6. The method as recited in claim 1, wherein the step of forming a second layer  
2 of insulative material comprises forming an insulative layer having a thickness of approximately  
3 600 angstroms.

1                   7. The method as recited in claim 1, wherein the step of forming a second layer  
2 of insulative material comprises forming a layer of oxide.

1                   8. The method as recited in claim 1, wherein the step of forming a second layer  
2 of insulative material comprises forming a layer of TEOS oxide by a plasma enhanced chemical  
3 vapor deposition process.

1                   9. The method as recited in claim 1, wherein the step of forming a second layer  
2 of insulative material comprises forming a layer of TEOS oxide having a thickness of  
3 approximately 600 angstroms.

1                   10. The method as recited in claim 1, further comprising the step of forming a  
2 third layer of insulative material over the second layer of insulative material, the etching step also  
3 etching through the third insulative layer, and the depositing step also depositing metal on walls  
4 of the etched third layer of insulative material.

1                   11. A method as recited in claim 10, wherein forming the third layer of  
2 insulating material comprises applying the third layer of insulating material by a plasma  
3 enhanced chemical vapor deposition process.

1                   12. A method as recited in claim 1, wherein forming the third layer of  
2 insulating material comprises applying a layer of phosphorus doped oxide.

1                   13. The method as recited in claim 1, further comprising the step of forming a  
2 fourth layer of insulative material over the third layer of insulative material, the etching step also

etching through the fourth insulative layer, and the depositing step also depositing metal on walls of the etched fourth layer of insulative material.

14. A method as recited in claim 13, wherein forming the fourth layer of insulative material comprises applying a layer of boron and phosphorus doped oxide.

15. A method as recited in claim 13, wherein forming the fourth layer of insulative material comprises applying a layer of oxide by a plasma enhanced chemical vapor deposition process.

16. A Schottky diode, comprising:

a first layer of insulative material having a first etch rate over the surface of a semiconductor substrate;

a second layer of insulative material having a second etch rate, the second etch rate being greater than the first etch rate, over the first layer of insulative material;

a window etched in a single etching step through the first and second layers of insulative material to the semiconductor substrate, the window forming walls having a topology of stepped thickness of insulative material due to the etch rates differing, the first layer of insulative material having an extended portion extending into the window; and

a metal deposited in the window to form a metal-semiconductor substrate contact, the metal conforming to the topology of the walls of the window and the semiconductor substrate, the metal deposited on an upper surface of the extended portion of the first layer of insulative material to form a stepped structure relative to the metal formed on the substrate within the window.

1                    17.     A Schottky diode as recited in claim 16, wherein the extended portion of  
2     the first layer of insulative material has a height and width sufficient to overcome short channel  
3     effects.

1                    18.     A Schottky diode as recited in claim 16, further comprising a barrier layer  
2     in the window between the substrate and the metal.

1                    19.     A Schottky diode as recited in claim 16, wherein the first layer of  
2     insulative material comprises a thickness of approximately 350 to 400 angstroms.

1                    20.     A Schottky diode as recited in claim 16, wherein the second layer of  
2     insulative material comprises a thickness of approximately 600 angstroms.

1                    21.     A Schottky diode as recited in claim 16, wherein the extended portion of  
2     the first layer of insulative material extends approximately 1000 angstroms beyond the wall of  
3     the second layer of insulative material.

1                    22.     A Schottky diode as recited in claim 16, wherein the second layer of  
2     insulative material comprises a thickness of approximately 1.5 to 2 times the thickness of the first  
3     layer of insulative material.

1                    23.     An integrated circuit including a Schottky diode, comprising:  
2                    a first layer of insulative material having a first etch rate over the surface of a  
3     semiconductor substrate;  
4                    a second layer of insulative material having a second etch rate, the second etch  
5     rate being greater than the first etch rate, over the first layer of insulative material;  
6                    a window etched in a single etching step through the first and second layers of  
7     insulative material to the semiconductor substrate, the window forming walls having a topology

8 of stepped thickness of insulative material due to the etch rates differing, the first layer of  
9 insulative material having an extended portion extending into the window; and  
10 a metal deposited in the window to form a metal-semiconductor substrate contact,  
11 the metal conforming to the topology of the walls of the window and the semiconductor  
12 substrate, the metal deposited on an upper surface of the extended portion of the first layer of  
13 insulative material to form a stepped structure relative to the metal formed on the substrate  
14 within the window.

1 24. An integrated circuit as recited in claim 23, wherein the extended portion  
2 of the first layer of insulative material has a height and width sufficient to overcome short  
3 channel effects.

1 25. An integrated circuit as recited in claim 23, further comprising a barrier  
2 layer in the window between the substrate and the metal.

1 26. An integrated circuit as recited in claim 23, wherein the first layer of  
2 insulative material comprises a thickness of approximately 350 to 400 angstroms.

1 27. An integrated circuit as recited in claim 23, wherein the second layer of  
2 insulative material comprises a thickness of approximately 600 angstroms.

1 28. An integrated circuit as recited in claim 23, wherein the extended portion  
2 of the first layer of insulative material extends approximately 1000 angstroms beyond the wall of  
3 the second layer of insulative material.

1 29. An integrated circuit as recited in claim 23, wherein the second layer of  
2 insulative material comprises a thickness of approximately 1.5 to 2 times the thickness of the first  
3 layer of insulative material.

1                    30.     An integrated circuit as recited in claim 23, wherein the width of the  
2     extended portion of the second layer of insulative material is approximately two to three times  
3     the thickness of the first layer of insulative material.

1                    31.     An integrated circuit as recited in claim 23, wherein the width of the  
2     extended portion of the second layer of insulative material is approximately two to three times  
3     the thickness of the insulative material of the extended portion.